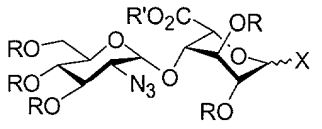
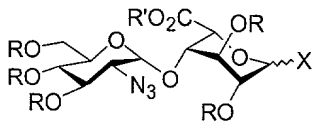
We claim:

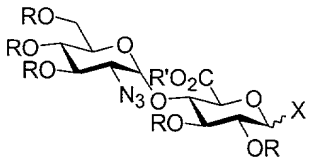
1. A disaccharide selected from the group consisting of:



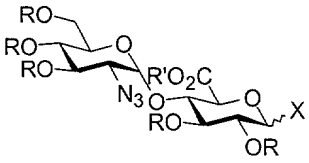
;



;



; and



;

wherein

X represents independently for each occurrence hydroxyl, acyloxy, silyloxy, halide, alkylthio, arylthio, alkoxy, aryloxy, or $-OC(NH)CCl_3$;

R represents independently for each occurrence H, alkyl, aryl, arylalkyl, heteroarylalkyl, silyl, acyl, alkenyloxycarbonyl, or aralkyloxycarbonyl; and

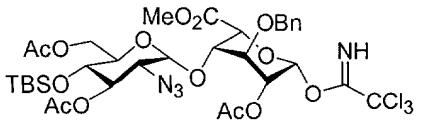
R' represents independently for each occurrence H, alkyl, aryl, arylalkyl, or heteroarylalkyl.

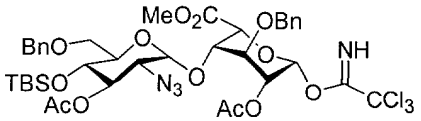
2. The disaccharide of claim 1, wherein X represents fluoro, bromo, 4-pentenyloxy or $-OC(NH)CCl_3$.

3. The disaccharide of claim 1, wherein R' represents independently for each occurrence alkyl.

4. The disaccharide of claim 1, wherein X represents fluoro, bromo, 4-pentenyloxy or $-OC(NH)CCl_3$; and R' represents independently for each occurrence alkyl.

5. The disaccharide of claim 1, wherein said disaccharide is selected from the group consisting of:


;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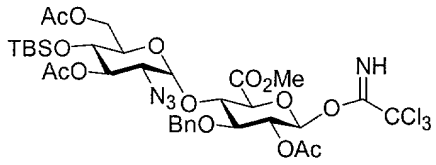
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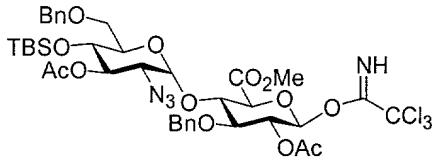
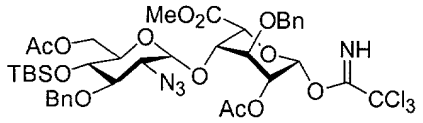
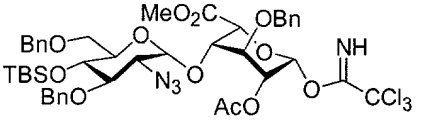
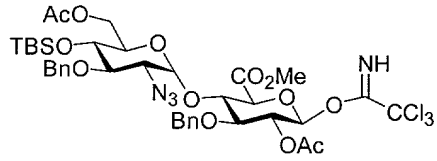
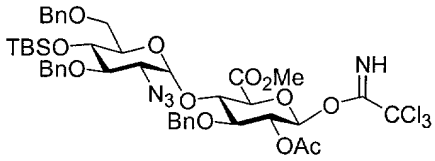

;

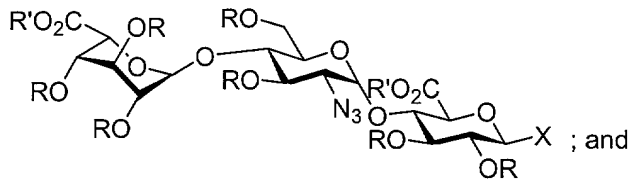

;

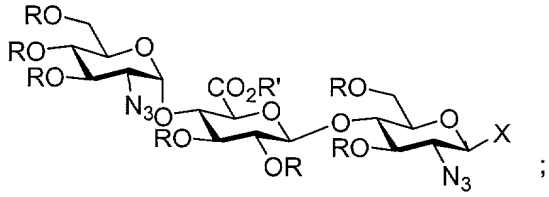

;


; and


.

6. A trisaccharide selected from the group consisting of:


; and


;

wherein

X represents independently for each occurrence hydroxyl, acyloxy, silyloxy, halide, alkylthio, arylthio, alkoxy, aryloxy, or $-OC(NH)CCl_3$;

R represents independently for each occurrence H, alkyl, aryl, arylalkyl, heteroarylalkyl, silyl, acyl, alkenyloxycarbonyl, or aralkyloxycarbonyl; and

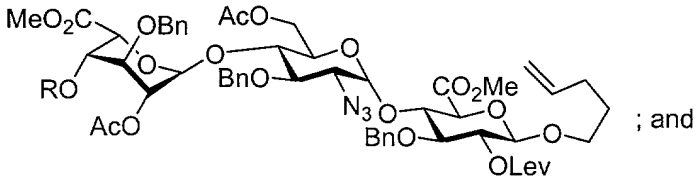
R' represents independently for each occurrence H, alkyl, aryl, arylalkyl, or heteroarylalkyl.

7. The trisaccharide of claim 6, wherein X represents fluoro, bromo, 4-pentenyloxy or -$OC(NH)CCl_3$.

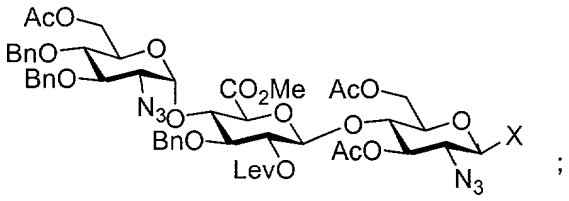
8. The trisaccharide of claim 6, wherein R' represents independently for each occurrence alkyl.

9. The trisaccharide of claim 6, wherein X represents fluoro, bromo, 4-pentenyloxy or -$OC(NH)CCl_3$; and R' represents independently for each occurrence alkyl.

10. The trisaccharide of claim 6, wherein said trisaccharide is selected from the group consisting of:



; and



;

wherein

X is silyloxy or -$OC(NH)CCl_3$; and

R is H or silyloxy.

11. A method of preparing a glycosaminoglycan, comprising the step of:

reacting a first mono-, di- or tri-saccharide, comprising an activated anomeric carbon, with a second mono-, di- or tri-saccharide, comprising a hydroxyl or amino group, to form an oligosaccharide, comprising a glycosidic linkage between said anomeric carbon of said first mono-, di- or tri-saccharide and said hydroxyl or amino group of said second mono-, di- or tri-saccharide.

12. The method of claim 11, wherein the first mono-, di- or tri-saccharide is not identical to the second mono-, di- or tri-saccharide.

13. The method of claim 11, wherein neither the first mono-, di- or tri-saccharide nor the second mono-, di- or tri-saccharide is covalently linked to a solid support.

14. The method of claim 11, wherein the first first mono-, di- or tri-saccharide or the second mono-, di- or tri-saccharide is covalently linked to a solid support.

15. The method of claim 14, further comprising the step of:

cleaving said covalent linkage between said oligosaccharide and said solid support with an alkene metathesis catalyst and an alkene.

16. The method of claim 11, further comprising the step of:

sulfating a hydroxyl or amino moiety of said oligosaccharide.

17. The method of claim 11, further comprising the step of:

removing a hydroxyl or amino protecting group from said oligosaccharide by hydrogenolysis.

18. A method of preparing an oligosaccharide comprising an α-glucosamine glycosidic linkage, comprising the step of:

reacting a uronic acid glycopyranosyl acceptor, comprising a hydroxyl group at C4 and a cyclic acetal comprising C1 and C2, with a glycosyl donor, comprising an activated anomeric carbon and an azide functional group at C2, to form an oligosaccharide comprising an α-glycosidic linkage between said hydroxyl group of said uronic acid glycopyranosyl acceptor and said anomeric carbon of said glycosyl donor.

19. The method of claim 18, wherein said uronic acid glycopyranosyl acceptor is an iduronic acid glycopyranosyl acceptor.

20. The method of claim 18, wherein said uronic acid glycopyranosyl acceptor is a glucuronic acid glycopyranosyl acceptor.

21. The method of claim 18, 19, or 20, wherein said glycosyl donor is a glycosyl fluoride or glycosyl trichloroacetimidate.

22. The method of claim 21, wherein said cyclic acetal comprising C1 and C2 of said uronic acid glycopyranosyl acceptor is an isopropylidene acetal or a cyclopentylidene acetal.